**3GPP T****SG-RAN WG2 Meeting #116-bis-e R2-220xxxx**

**E-Meeting, Jan 17th – Jan 25th, 2022**

**Agenda item:**  **8.10.4**

**Source: Intel Corporation**

**Title: List of open issues on NR NTN UE capabilities**

**Document for: Discussion**

# Introduction

This is the report of the following email discussion:

**[Post116bis-e][110][NTN] 38.306 running CR and list of open issues (Intel)**

Scope: Update the 38.306 running CR and define the list of open issues regarding UE capabilities

Intended outcome: Endorsed 38.306 running CR and list of open issues regarding UE capabilities

Deadline (for companies' feedback): Friday 2022-01-28 0800 UTC

Deadline (for updated running CR in R2-2201961 and list of open issues in R2-2201962): Friday 2022-01-28 1600 UTC

Status: Ongoing

In this offline discussion, companies are invited to provide bubble comments in draft CRs directly, and this report is used for collection of open issues on UE capabilities.

# Discussion

During the online discussion, the following agreements were achieved:

Agreements:

1. define one single NR NTN UE capability to encompass essential features to support NTN, and UE can further indicate other optional capabilities.
2. gnss-Location-r16 is conditionally mandatory when UE indicates the support of NR NTN access, and update the field description to cover NTN case.
3. consider the following differentiation of user plane enhancements as baseline:

 Essential sub-features include:

 1) the adaptations of RACH;

 2) DRX HARQ RTT timer extension;

 3) the timer extension to accommodate long RTT for other MAC timers (e.g., extended sr-ProhibitTimer);

 4) the timer extension to accommodate long RTT in RLC and PDCP layers (FFS for LEO)

 Optional sub-features include:

 1) TA reporting (TA reporting during RACH using MAC CE, and Event-triggers for TA reporting in connected mode);

 2) disabling HARQ feedback for downlink transmission;

 3) new HARQ state for uplink transmission and the corresponding new LCP mapping rule for dynamic grants.

4. consider the following differentiation of control plane enhancements as baseline:

 Essential sub-features include (for NGSO, FFS for GEO):

 1) soft TAC update;

 2) SMTC enhancements (event-triggered assistance information reporting, 2 SMTC in parallel);

 Optional sub-features include:

 1) cell stop-time based neighbour cell measurements;

 2) location based cell reselection criteria;

 3) SMTC enhancements (4 SMTC in parallel and UE based solution in idle/inactive);

 4) CHO enhancements (location based CHO).

 FFS if CHO enhancements (time based and Event A4 based CHO) is essential or optional

1. Postpone the UE capability discussion on location reporting

Working Assumption (further check if anything can be per band):

1. the granularities of all the optional RAN2 determined sub-features with capability signalling are per UE.

Agreements via email - from offline 112:

1. RAN2 confirms that the RLC timer extension (i.e., t-Reassembly timer) is also essential for NGSO.
2. RAN2 confirms that the PDCP timer extension (i.e., discardTimer and t-Reordering timer) is also essential for NGSO.
3. RAN2 confirms that Multiple TACs feature (i.e., UE should be able derive multiple TACs per PLMN in a cell, and indicate to NAS layer all received TACs per PLMN) is essential for both GSO and NGSO.
4. The support of essential NTN features should be the Prerequisite for optional NR NTN UE capabilities.

Agreements:

1. Define single UE capability to encompass all features essential to support both GSO and NGSO, i.e., when UE indicates it, it means UE supports all the GSO and NGSO essential features (FFS for SMTC enhancements). (this does not automatically mean that interoperability testing between GSO and NGSO is also supported)
2. UE capabilities for optional CHO enhancements (at least location based CHO) for NTN are per band, which is also in line with R16 CHO design

According to RAN2 leadership’s plan, a list of open issues can be created before Jan 28th, then we could have a pre-meeting offline discussion between Feb 9th -14th.

As a starting point, rapporteur suggests the following open issues for confirmation:

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| **List of open issues on UE capabilities****Set 1 for pre-meeting offline discussion:****Regarding Essential features:**1. Whether to specify that SMTC enhancements (event-triggered assistance information reporting, 2 SMTC in parallel) are only essential for NGSO;
2. Whether CHO enhancements (time based and Event A4 based CHO) are essential for both GSO and NGSO, or only for NGSO, or optional.

**Regarding Optional features:**1. Whether to have separate RAN2-specific TA reporting UE capability, i.e., TA offset threshold based reporting, or incorporate this feature into TA reporting UE capability defined in RAN1 feature list;
2. Whether to have two UE capabilities for UL HARQ state B and the new LCP restriction respectively.

**Regarding New UE capability bits:**1. Whether to define a separate UE capability to indicate that the UE supports the new NTN specific SIB;
2. RAN2 to discuss whether/how to indicate one TN feature can be supported or not in NTN:

Option 1:            We discuss case by case, e.g., 2-step RACH in NTN may need a separate IoT bit as existing 2-step RACH UE capability bit is considered only for TN. Option 2:            We enable signalling possibility for at least MAC parameters, measurement parameters, SON/MDT, RRC\_INACTIVE to be separately indicated for NTN.Option 3:            Whether optional TN feature can be supported or not in NTN is indicated based on the existing UE capability signalling, e.g., if UE indicates support of 2-step RACH using existing UE capability bit, 2-step RACH is supported in both TN and NTN.**Set 2 for postponed open issues:****Postponed discussion (need to wait for other WG’s input or more stage-3 discussion):**1. Postpone the discussion on granularity of SMTC UE capabilities (e.g., 4 SMTC in parallel), since RAN1/4 may define them as per band
2. Postpone the UE capability discussion on measurement gaps for connected mode;
3. Postpone the UE capability discussion on location reporting.
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**Question 1: Do you agree that the open issues in “Set 1” should be discussed in pre-RAN2#117-e offline discussion?**

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| **Company** | **Agree/Disagree** | **Additional comments** |
| Samsung | Agree except UE capability for NTN specific SIB | We think there is no need to define a separate UE capability to indicate that the UE supports the new NTN specific SIB, it should be mandatory for any UE supporting NTN.  |
| OPPO | Agree with comments | We think being able to read the new NTN specific SIB should be a UE capability that is essential and mandatory supported for UEs supporting NTN. |
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**Question 2: Do you agree that the open issues in “Set 2” should NOT be discussed in pre-RAN2#117-e offline discussion?**

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| **Company** | **Agree/Disagree** | **Additional comments** |
| Samsung | Agree |  |
| OPPO | Agree |  |
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**Question 3: which open issue that has NOT been covered in the list above should be discussed in pre-RAN2#117-e offline discussion?**

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| **Company** | **Open issue** | **Additional comments** |
| Samsung | Whether/how to indicate a UE only supports NGSO or a UE only supports GSO or both. | A single UE capability indication for essential features to support both GSO and GSO does not mean that interoperability testing between GSO and NGSO is also supported. UE needs to further indicate whether it is tested and supporting GSO, or NGSO, or both. |
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# Conclusion

Based on this offline discussion on UE capabilities, the following proposals are made: